

# CHARGE PUMP VOLTAGE REGULATOR

## ABSTRACT

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10 A voltage regulator (11) provides a pulse width modulated voltage regulator output (40) to a drive circuit (37) to provide field coil excitation for a voltage generator (15 - 17) providing a charging signal for a battery (14). The voltage regulator output determines on/off states of an FET power switching device (28) coupled in series with a field coil (17) <sup>across</sup> ~~between~~ a maximum power source voltage potential  $V_{BAT}$  corresponding to battery voltage. The drive circuit 15 includes a charge pump (26, 35, 36) with a low capacitance capacitor (26) coupled and decoupled <sup>across</sup> ~~between~~ a source of voltage potential at a rate determined by a high frequency signal (41), provided by the regulator, having a frequency substantially in excess of the 20 frequency of the voltage regulator output. The drive circuit includes a pair of switches (21, 35) which alternately couple one terminal of the capacitor to either battery voltage or ground potential in accordance with the voltage regulator output. The above 25 configuration provides a control voltage (44) at the gate of the FET substantially in excess of battery voltage and this insures maximum field current when the FET is on. This is achieved with a minimum capacitance for the capacitor, thus reducing circuit size and cost. Battery 30 current drain of the drive circuit is minimized by disconnecting the one terminal of the capacitor from battery voltage when the FET is off.

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